Preparing Students for College Science Courses

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- Biology
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- Chemistry
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- Physics
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Theme

An informing dialogue to address three intertwined questions:

- What are you preparing students for?

  AND

- What are we preparing students for?

  AND

- How do we work together to achieve these goals?

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Prerequisites for Science Courses

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Prerequisites for Science Courses

- Anatomy & Physiology—minimum composite ACT of 18
- General Biology—minimum composite ACT of 18
- General Chemistry—minimum Math ACT score of 19 or SAT score of 460
- Survey of Chemistry—minimum MATH ACT score of 17 or SAT score of 420
- General Physics—Precalculus Algebra and Trig OR Calculus I

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AP Credit in the Sciences

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AP Science Courses

- Biology—The student must take BIOL 161; if he/she passes with a “B” or better and received a “5” on the biology AP exam, he/she will be exempt from enrolling in BIOL 162
- Chemistry—The student who received a “5” on the chemistry AP exam will usually be given credit for CHEM 151. Credit for CHEM 151 & 152 requires a “5” on the AP exam and two years of HS chemistry, including laboratory work that is equivalent to our university chemistry lab

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Are AP Courses Accepted in Medical/Dental School

- Students planning to attend medical or dental school will need to take additional hours in biology or chemistry as these schools do not accept AP credit

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Mastering the Content

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Important Skills for All Science Courses

- Ability to answer short answer/essay questions on exams
- Reading and following a syllabus
- Develop the attitude that “I can do this” rather than “Science is hard; I can’t do it”

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Important Skills for All Science Courses

- Concept mastery from high school is expected
  - Expect to invest extra time making up for what was not mastered in high school
- Ability to recognize when help is needed
- High performance time management
  - For sciences – be prepared to effectively spend two plus hours outside of class for every hour in class.

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Problem Solving/Math Skills

How can academy students develop stronger abilities to solve quantitative problems?

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Problem Solving/Math Skills

- Do students learn in academy that math skills are prerequisite for success in science courses?
- How can students develop confidence in expert-like strategies and disciplines?
  - take one step at a time even when the end is not in sight
  - Do they have enough opportunity to struggle?

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Problem Solving/Math Skills

- Students must know how to strategically rearrange equations; don't rely on "tricks" or calculators.
- Opportunities for critical analysis: "Does the answer make sense?" or "What's wrong?"
- A test question in Chemistry or Physics may begin with solving two equations with two unknowns before it even gets interesting!

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Biology

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- Biology Majors must be able to write
- Reading comprehension
  - Learn to assimilate large volumes of information quickly
- Computer skills—Excel and Word

- Things I hear from students:
  - “Isn’t there something I can do…EXTRA CREDIT
  - “I never had to study before.”
  - “I’ve never made a ‘C’ before.”

Chemistry

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- A well-prepared student taking General Chemistry or Survey of Chemistry will:
  - Know several element and ion names and symbols
  - Understand the information given by a chemical formula
  - Know that the arrangement of the periodic table means something
  - Know how to balance a chemical equation and what it means

- A well prepared students taking General Chemistry or Survey of Chemistry I will:
  - Have learned basic laboratory skills
    - Safety instruction
    - Identity of basic glassware—beaker vs. graduated cylinder
    - Translating directions into action

Physics

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How could Sidney have been better-prepared?

- A in HS Physics and a B+ in HS Precal…
- …but with a 18 on the ACT (17 Verbal, 18 Math)
- W or F on fundamental courses and repeated them (3 times in at least 2 cases)
- She lacked three critical abilities:
  - to clearly articulate ideas precisely, which led to "muddy" reasoning (note verbal ACT)
  - to self-assess knowledge gaps
  - the drive to take charge of her education

A well-prepared physics student…

- Can *easily* solve algebraic equations like $\frac{1}{4} = \frac{1}{1/2} + \frac{1}{d}$ or $\frac{1}{2} = e^{4x}$, *without a fancy calculator*.
- Explains work *clearly and articulately* (on paper and in conversation) following expert-like disciplines.
- Wishes to see the world through a different lens rather than simply "cram and dump"
- Expects to <u>work</u> to gain understanding

Physics - Blake Laing Ph.D..

If you are interested in discussing the teaching of physics, chemistry, or biology over lunch today, let's go to lunch together.

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